

REMARKS

Applicants have amended Claim 13 to clarify the present amendment. Claims 13-16 are prosecuted herein, with Claims 17-19 being to a non-elected species.

Applicants' amended claim 13 is to a heat pipe cooler that has a heat receiving plate with first and second opposite surfaces, the heat receiving plate being adapted at the first surface to contact an element which generates heat and is to be cooled, and at least one heat pipe fixed to the second surface of the heat receiving plate for thermal conduction, the at least one heat pipe being upstanding with respect to the heat receiving plate, with the heat pipe being sealed at opposite end portions. A plurality of parallel heat radiating plates are fixed to the heat pipe at positions along the heat pipe toward an end thereof, with the parallel heat radiating plates extending substantially parallel to the heat receiving plate. A distance between the heat receiving plate and one of the parallel heat radiating plates which is located adjacent the heat receiving plate is substantially greater than a distance between two adjacent parallel heat radiating plates. A ventilation duct is provided having an air inlet and air outlet surrounding the parallel heat radiating plates and defining a passage for air through a gap between the parallel heat radiating plates and a fan is provided for producing a current of air through the duct. Such an arrangement is not taught or suggested in the references.

Reconsideration and removal of the rejection of Claims 13 and 15 as obvious under 35 U.S.C. §103 in view of a combination of Yamakage and Ishida et al., and of Claims 14 and 16 as obvious under 35 U.S.C. §103 in view of a combination of Yamakage, Ishida et al. and Inoue et al. are respectfully requested in view of the present amendment to Claim 13 and the following remarks.

The present amendment to Claim 13 provides that the heat receiving portion of the heat pipe is arranged a substantial distance from the cooling part (that part of the heat pipe to which parallel heat radiating plates are attached, as clearly illustrated in Figure 13). Generally, in a heat pipe, liquid is evaporated at the heat receiving part, taking heat from the heat receiving plate, and gas is liquified at the cooling part. If the heat receiving part is arranged near the cooling part (this is contrary to the present invention), the evaporating action of the heat receiving part is affected by the cooling action of the cooling part so that the liquid is not so fully evaporated at the heat receiving part, resulting in an insufficient cooling efficiency. Thus, with the present claimed arrangement, cooling efficiency is improved.

The Yamakage reference discloses a cooling device including, a metal block 2, a heat pipe 9 and fins (heat radiating plates) 11. One half of the heat pipe 9 is called a heat receiving part 9a, and is embedded in the hole 3 of the metal block 2. In Figs. 1 and 2, the opposite ends of the heat pipe 9 are initially opened and the heat receiving part 9a is expanded in the hole 3 so that the outer surface of the heat receiving part 9a and the inner surface of the hole of the metal block are brought into close contact with each other. The fluid is then introduced in the heat pipe 9 and the outer end 9c is sealed with a seal (the inner end is closed by the bottom wall of the hole 3). In Fig. 3, the end 9d of the heat receiving part 9a is opened and sealed with a seal.

The metal block 2 of Yamakage is not a plate and is quite distinct from the heat receiving plate of the present invention. In Fig. 5, a semiconductor element (heat generating element) 1 is attached to one of the opposite surfaces, but the heat pipe 9 is not attached to the other of the opposite surfaces. The heat pipe 9 is attached to the side or top of the metal block 2. Fins 6 are quite

small. One half of the heat pipe 9 is used as a heat receiving part 9a, and the proportion of the heat pipe at which heat can be radiated is small.

Ishida et al. merely shows a U-shaped heat pipe and does not add to the Yamakage teachings that would render Applicants' amended Claim 13 obvious. This is also true relative to the teachings of Inoue et al.

In view of the aforementioned amendments and accompanying remarks, claims 13-16, as amended, are believed to be patentable and in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

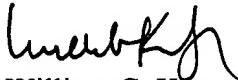
Attached hereto is a marked-up version of the changes made to the by the current amendment. The attached page is captioned "Version with markings to show changes made."

09/044,030

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully Submitted,

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IN THE CLAIMS:

Please amend Claim 13, as follows:

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13. (Amended) A heat pipe cooler, comprising:

a heat receiving plate having first and second opposite surfaces, said heat receiving plate being adapted at said first surface to contact an element which generates heat and is to be cooled;

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at least one heat pipe having [a generally U- or V-shaped profile, opposite end portions,
and a middle portion between said opposite end portions, said heat pipe being] fixed [at said
middle portion] to said second surface of said heat receiving plate for thermal conduction, [with
said opposite end portions] said at least one heat pipe being upstanding with respect to said heat
receiving plate, and said at least one heat pipe being sealed at [its] opposite end portions thereof,

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a plurality of parallel heat radiating plates fixed to said at least one heat pipe at positions
along said at least one heat pipe toward an end thereof [each of said opposite end portions], said
parallel heat radiating plates extending substantially parallel to said heat receiving plate;

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a distance between said heat receiving plate and one of said parallel heat radiating plates
which is located adjacent the heat receiving plate being substantially greater than a distance
between two adjacent said parallel heat radiating plates:

D
a ventilation duct having an air inlet and air outlet surrounding said parallel heat radiating plates and defining a passage for air through a gap between said parallel heat radiating plates; and
F
a fan producing a current of air through said duct.